

SUPPORT FOR THE AMENDMENT

This Amendment cancels Claim 7; and amends Claim 1. Support for the amendments is found in the specification and claims as originally filed. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-6 and 8-12 will be pending in this application. Claim 1 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

The present invention is based on the findings that small amounts of acetic acid or propionic acid which are usually present in acrylic acid are responsible for the malodorous properties of superabsorbent polymers derived from acrylic acid. However, the unpleasant odor can only be noticed and thus is particularly acute when the superabsorbent polymer has been subjected to a post-surface crosslinking step. See specification at page 2, lines 25-31.

Acrylic acid is a bulk chemical that is produced in an amount of more than one million tons per year. Such bulk chemicals must be produced at low cost and a further purification of a bulk chemical will only be performed in those cases where it is absolutely necessary. No one will purify a bulk chemical without an extraordinary need, since purification will dramatically increase costs. If a certain impurity interferes with an intended use, it will be removed in the least expensive manner. Any purification will be designed to remove only those impurities which must be removed. Therefore, acrylic acid will generally be used as it is, i.e., as it is obtained in the production process. If acrylic acid contains a specific impurity which interferes with a subsequent use (such as stabilizers or  $\beta$ -hydroxy propionic acid) the purification measure would be designed in a manner that allows efficient

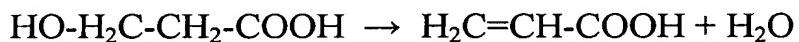
removal at minimum cost of the specific impurity without giving much weight to other impurities that might be present.

Claims 1 and 4-12 are rejected under 35 U.S.C. § 102(e) over U.S. Patent No. 6,388,000 ("Irie"). In addition, Claims 2-3 are rejected under 35 U.S.C. § 103(a) over Irie in view of U.S. Patent No. 5,504,247 ("Saxer").

Irie discloses a method for the production of a hydrophilic resin which comprises using a water-soluble unsaturated monomer having a β-hydroxy propionic acid (salt) content of not more than 1,000 ppm. Irie at Abstract.

Irie addresses the problem of residual monomer content in superabsorbent polymers. Irie found that this problem can be overcome by using an acrylic acid which is partially or completely neutralized and which contains not more than 1,000 ppm of β-hydroxy propionic acid. However, a low residual monomer content is not the object of the present invention.

It must be noted that β-hydroxy propionic acid can be easily removed from acrylic acid by distillation (Irie at column 8, line 55 ff. and column 19, line 19 to column 20, line 45). This is because β-hydroxy propionic acid is likely to decompose upon thermal treatment into acrylic acid as shown in the following equation.



Thus, a reduction in the concentration of β-hydroxy propionic acid can simply be achieved by distillation of acrylic acid as taught by Irie.

On the other hand, it is not possible to reduce the concentration of propionic acid ( $\text{CH}_3\text{CH}_2\text{COOH}$ ) and acetic acid ( $\text{CH}_3\text{COOH}$ ) by simple distillation. This is because propionic acid has a boiling point of 141°C which is identical with the boiling point of acrylic

acid, and acetic acid has a boiling of 118°C which is rather close to the boiling point of acrylic acid. Therefore, the reduction of the total concentration of acrylic acid and propionic acid in acrylic acid to a ppm range requires more elaborate purification techniques than the simple distillation techniques taught by Irie. This is confirmed in the specification at page 23 by comparative Example 3 where acrylic acid was purified by distillation. The distillation produced acrylic acid containing 1,200 ppm of acetic acid and 300 ppm of propionic acid, which is more than three times higher than the required maximum level according to the present invention.

Consequently, Irie fails to disclose or suggest the use of an acrylic acid for the production of hydrogel-forming polymers where the total concentration of acetic acid ( $\text{CH}_3\text{COOH}$ ) and propionic acid ( $\text{CH}_3\text{CH}_2\text{COOH}$ ) is below 400 ppm. Irie fails to disclose or suggest the independent Claim 1 limitation of "a process for preparing a low-odor hydrogel-forming acrylic acid polymer, which comprises the steps of: a) preparing a polymeric hydrogel by free-radically polymerizing a monomer composition comprising at least 50% by weight of acrylic acid containing volatile **saturated carboxylic acids selected from the group consisting of acetic acid, propionic acid and combinations thereof as impurities in a total amount of less than 400 ppm**, by weight, based on the amount of acrylic acid . . .; and b) treating said particulate hydrogel or said hydrogel-forming powder with a crosslinking substance".

Saxer discloses a method of purifying acrylic acid. In a Table 4, Saxer discloses a product containing 0.018% acetic acid and 0.005% propionic acid.

There is no reasonable expectation that Irie in view of Saxer would have led the skilled artisan to the claimed invention. As discussed above, acrylic acid is a bulk chemical. Bulk chemicals are only purified with regards to those impurities which are none to deteriorate the intended use of the bulk chemical. Consequently a skilled person would

purify acrylic acid being intended for the production of hydrogel-forming polymers only from those impurities which are known to interfere with the formation of the properties of the superabsorbent. Since before the present inventors no one had identified acetic acid and propionic acid as being problematic in the production of post-surface crosslinked superabsorbent polymers, the skilled artisan would not be motivated to reduce these impurities. Rather, the skilled artisan would have been prevented from doing so, because of the increased cost associated with the additional purification measures. Thus, there is no reasonable expectation that the cited prior art would have led the skilled artisan to the invention of independent Claim 1.

Any *prima facie* case of obviousness based on the cited prior art is rebutted by the significant reduction in bad odor in polymers derived from acrylic acid that is achieved by the present invention by limiting the total amount of impurities of acetic acid and propionic acid in the acrylic acid to less than 400 ppm. The working examples in the specification show that the total concentration of acetic acid and propionic acid must be low in order to obtain a post surface crosslinked superabsorbent polymer that has good odor properties (see specification examples on page 23). Moreover, comparative Example 3 reveals that an acrylic acid which was purified by distillation, and thus contains only small amounts of  $\beta$ -hydroxy propionic acid, does not lead to a hydrogel-forming polymer having good odor properties, since the total concentration of acetic acid and propionic acid is still high.

The cited prior art fails to suggest that bad odor from polymer produced from acrylic acid can be reduced by limiting the total amount of acetic acid and propionic acid impurities in the acrylic acid to less than 400 ppm. Irie is concerned with the problem of residual monomers, which themselves may be a problem. Irie does not address the problem of bad odor when primarily formed granules of the superabsorbent polymers are subjected to a post surface crosslinking. Irie only focuses on the concentration of  $\beta$ -hydroxy propionic acid and

does not recognize that the concentration of acetic acid and propionic acid plays an important role with regard to the odor properties of the post-surface crosslinked polymers. Saxer is concerned with providing an "eco-friendlier" method of purifying acrylic acid, but is silent about the odor of polymer produced from acrylic acid.

Because the cited prior art fails to suggest the significant reduction in bad odor in polymers derived from acrylic acid that is achieved by the present invention by limiting the total amount of impurities of acetic acid and propionic acid in the acrylic acid to less than 400 ppm, any *prima facie* case of obviousness based on the cited prior art is rebutted.

Because the cited prior art fails to disclose or suggest all the limitations of independent Claim 1; there is no reasonable expectation of success; and any *prima facie* case of obviousness is rebutted, the prior art rejections should be withdrawn.

Claim 7 is objected to. Claim 7 is canceled, so the objection is moot and should be withdrawn.

Applicants respectfully request that the Examiner acknowledge consideration of the references cited in the Information Disclosure Statement filed July 14, 2006, after the Final Rejection was mailed on June 19, 2006.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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